PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-236203

(43)Date of publication of application : 23.08.2002

(51)Int.Cl. G02B 5/02
G02F 1/1335
G02F 1/13357
G09F 9/00
// B29D 11/00

(21)Application number : 2001-031747

(22)Date of filing : 08.02.2001

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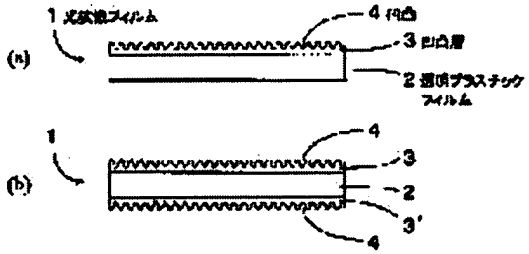
(54) LIGHT DIFFUSING FILM, METHOD FOR MANUFACTURING THE FILM, SURFACE LIGHT SOURCE DEVICE USING THE FILM AND DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a new protective film to solve the problem that a conventional protective film damages the surface of the object in contact with the protective film because of beads included in the protective film, and to provide a surface light source device which uses the new protective film and moreover, a display device which uses the surface light source device.

SOLUTION: The light diffusing film 1 is formed by laminating a rough layer 3 having a rough surface 4 on at least one surface of a transparent plastic film 2. The ten-point average roughness of the rough surface is specified to 0.5 μm to 2.0 μm and the peak count number by the Pc1 method is specified to 16 to 60.



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2.**** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the surface light source equipment using the optical diffusion film which can raise transverse-plane brightness, and its optical diffusion film, and the display using the surface light source equipment further by using for surface light source equipment etc.
[0002]
[Description of the Prior Art] Lighting is performed from a tooth back and a liquid crystal display is one of the typical things of the display made it an image appear. If an example is shown in drawing 1 , the liquid crystal display 100 consists of a liquid crystal display panel 101 inserted by two polarizing plate 101a and 101a', and surface light source equipment 102 arranged among drawing on the inferior surface of tongue (an observation side side is equivalent to the field of the opposite side in case it is used.).
[0003] As for surface light source equipment 102, a reflecting plate 103, a light guide plate 104, the optical diffusion film 105, the lens sheet 106, and the protection film 107 are arranged in order from the bottom.
[0004] A light guide plate 104 is a transparence plate with dot pattern 104a to an inferior surface of tongue, and the light source L is arranged at the edge of the left of a light guide plate. This light source L may be arranged at every one right and left. In above surface light source equipment 102, after the light which came out of the light source L is introduced in a light guide plate 104 and repeats scattered reflection within a light guide plate 104, it is reflected by dot pattern 104a which it has on the inferior surface of tongue, and acts as Idemitsu of it towards various directions from the top face of a light guide plate 104. Although acted as Idemitsu also from the inferior surface of tongue of a light guide plate 104, it is reflected by the reflecting plate 103 and the light returns in a light guide plate 104. The optical diffusion film 105 on a light guide plate 104 is for it not being visible and carrying out dot pattern 104a of the inferior surface of tongue of a light guide plate 104.
[0005] Toward the back side of drawing, the longitudinal direction whose prism whose cross section is a rectangular equilateral triangle is prism arranges many lens sheets 106 on the top face of for example, transparence plastic film, and carries out a laminating to the longitudinal direction on a drawing on it. When such a lens sheet 106 has the operation which collects the light which acts in the various directions as Idemitsu in the direction centering on a transverse plane and repeats it to sense sense and two longitudinal directions of each prism cross at right angles using the lens sheet of the same structure in drawing 1 from the optical diffusion film 105, in case it is used, he is trying for light to gather in horizontal and the direction centering on a transverse plane also about which direction of vertical. Outgoing radiation of the light from the light source L is carried out to the shape of a field by the above configuration, and if it is the case of drawing, it will be floodlighted up.
[0006] Although only the above configuration can be used as surface light source equipment, the protection film 105 is further placed on the lens sheet 106. This protection film 107 has the concealment function the spacer of the minute blemish generated in a production process, the dust which carried out the miscarriage, or the shape of a minute particle to be used is made not to be in sight and to conceal

while having the protection feature which protects the top face of the lens sheet 106 from a blemish and dirt. As a protection film which has such a protection feature and a concealment function conventionally, on transparence plastic film, the coating constituent which blended the minute bead of the quality of organic or minerals is applied, the film of delustering which was dried or solidified and was acquired is used after spreading, and a spreading side is turned to a lens sheet side, and is used in piles.

[0007] However, if the lens sheet 106 and the protection film 107 of the above structures are piled up, since it is very weak, it grinds by the paint film containing the bead of the protection film 107, a blemish may be attached, and the front face of the lens sheet 106 is not desirable. moreover, the bead in a paint film may be boiled occasionally, may be carried out, may move about between dedropping, the lens sheet 106, and the protection film 107, and may attach a blemish Moreover, in surface light source equipment and a display, after becoming a product, it checks in many cases whether it examines by giving vibration and an operating state is maintained, but when vibration is given, the trouble by the above blemishes and the omissive bead happens. As mentioned above, since the conventional protection film had the paint film containing a bead, it might harm a partner's front face where a protection film touches.

[0008]

[Problem(s) to be Solved by the Invention] Therefore, in this invention, although the conventional protection film contains a bead therefore, let it be a technical problem to offer offering the new protection film which canceled harming a partner's front face where a protection film touches and the surface light source equipment using such a protection film, and the display using still such surface light source equipment.

[0009]

[Means for Solving the Problem] By constituting the paint film of a protection film using the coating constituent which does not contain a bead, the above-mentioned technical problem was solvable by changing to having considered as delustering by content of a bead, being in charge of formation of the shape of still such surface type by considering as the paint film which has the shape of surface roughness and surface type which limited the concavo-convex peak count, and performing mold face formation by sandblasting again.

[0010] The 1st invention is arranged between surface light source equipment and the indicating equipment of a format observed by transparency, and relates to the optical diffusion film characterized by having the following irregularity on one [at least] front face of transparence plastic film.

(1) The concavo-convex ten-point average of roughness height should be 0.5 micrometers - 2.0 micrometers.

(2) When you set peak count level of a top and the bottom to **0.1 micrometers of the center line of a granularity curve and you set measurement length to 0.8mm, the numbers of counts which counted as 1 that in which one point or more that a granularity curve intersects top peak count level exists while the granularity curve had exceeded bottom peak count level continuously should be 16-60.

In the 1st invention, the 2nd invention becomes one side of said transparence plastic film from the hardened material of ionizing-radiation hardenability resin, and relates to the optical diffusion film characterized by the concave convex layer which has irregularity on a front face carrying out the laminating. In the 1st invention, the 3rd invention becomes both sides of said transparence plastic film from the hardened material of ionizing-radiation hardenability resin, and relates to the optical diffusion film characterized by the concave convex layer which has irregularity on a front face carrying out the laminating. Between said concave convex surfaces and transparence plastic film which the 4th invention performed sandblasting processing to the front face of mold material, and formed the concave convex surface in it, next were formed After performing the laminating process which carries out the laminating of the ionizing-radiation hardenability resin and considering as a laminating condition, while irradiating ionizing radiation at said ionizing-radiation hardenability resin, stiffening said ionizing-radiation hardenability resin, with said laminating condition maintained and considering as hardening resin The hardening process pasted up on said transparence plastic film is performed. After that, It is related with

the manufacture approach of the optical diffusion film characterized by performing the exfoliation process at which said hardening resin with which the allocated type of the irregularity of the inversion configuration of said concave convex surface was carried out, and said transparence plastic film exfoliate the layered product which carried out the laminating from said concave convex surface. In the 4th invention, said mold material is a profile of roller, and the 5th invention relates to the manufacture approach of the optical diffusion film characterized by performing said laminating process, twisting said transparence plastic film around the mold material of said profile of roller, and performing a hardening process on the mold material of said profile of roller. The 6th invention relates to the optical diffusion film characterized by being manufactured by the manufacture approach of claim 4 or claim 5. The 7th invention relates to the surface light source equipment characterized by having either or the optical diffusion film according to claim 6 of claims 1-3 in the floodlighting side of a floodlighting means to floodlight the light from the light source and said light source in the predetermined direction, and said floodlighting means. The 8th invention relates to the display characterized by arranging surface light source equipment according to claim 7 at the tooth back of a display.

[0011]

[Embodiment of the Invention] this invention -- light -- diffusion -- a film -- one -- drawing 2 -- (-- a --) -- being shown -- as -- transparence -- plastic film -- two -- one side (drawing top face) -- a top face -- irregularity -- four -- having -- concave -- a convex layer -- three -- a laminating -- carrying out -- **** -- a thing -- it is -- or -- or -- drawing 2 -- (-- b --) -- being shown -- as -- transparence -- plastic film -- two -- both sides (drawing a top face and an inferior surface of tongue) -- each -- irregularity -- four -- having -- concave -- a convex layer -- three -- and -- irregularity -- four -- ' -- having -- concave -- a convex layer -- three -- ' -- a laminating -- carrying out -- **** -- a thing -- it is .

[0012] In this invention, irregularity 4 (unless it refuses especially, it is made to represent with irregularity 4 henceforth, since the same is said of concavo-convex 4') fulfills the following (1) and the conditions of (2). That is, the ten-point average of roughness height of (1) irregularity should be 0.5 micrometers - 2.0 micrometers.

(2) When you set peak count level of a top and the bottom to **0.1 micrometers of the center line of a granularity curve and you set measurement length to 0.8mm, the numbers of counts which counted as 1 that in which one point or more that a granularity curve intersects top peak count level exists while the granularity curve had exceeded bottom peak count level continuously should be 16-60.

[0013] The ten-point average of roughness height of the above (1) is the measured value based on JISB 0601-1994, and is the difference of the average of the altitude of the summit of the mountain from the highest to the 5th, and the average of the altitude of the bottom of thread from the deepest to the 5th to the average line of the part which sampled criteria die length from the cross-section curve of a device under test.

[0014] It is desirable that the ten-point average of roughness height of irregularity 4 is within the limits of 0.5 micrometers - 2.0 micrometers about the above (1). The concealment function the spacer of the minute blemish generated in a production process since irregularity is small as it is under a minimum, the dust which carried out the miscarriage, or the shape of a minute particle to be used is made not to be in sight is inadequate. Moreover, if irregularity 4 exceeds an upper limit, as a result of a concealment function's becoming high beyond the need, the sharp nature of an image at the time of looking at an image through an optical diffusion film is spoiled.

[0015] It asks for the number of counts of the above (2) as follows. As shown in drawing 3 , top peak count level and bottom peak count level are set up in parallel with the center line of a granularity curve. The difference of the peak count level of a top and the bottom and a center line, i.e., count level, is set up equally. Go from left-hand side and a granularity curve is checked toward right-hand side. After a granularity curve intersects bottom peak count level and exceeds bottom peak count level before intersecting bottom peak count level next (in other words) While the granularity curve has exceeded bottom peak count level continuously, the point that a granularity curve intersects top peak count level counts one or more places of a certain case among "1", and it asks for the number of counts per criteria die length. This count method is called Pc1 method. Here, it is asking for the number of counts, using

measurement length as 0.8mm using peak count level of a top and the bottom as **0.1 micrometers of the center line of a granularity curve.
[0016] It is desirable that the numbers of counts are 16-60 to measurement length;8mm about the above (2). In it being under a minimum, since there is concavo-convex [few], a concealment function is inadequate. Moreover, if the number of counts exceeds an upper limit, as a result of a concealment function's becoming high beyond the need, the sharp nature of an image at the time of looking at an image through an optical diffusion film is spoiled.
[0017] The optical diffusion film 1 of this invention is the semantics which cancels the fault of the conventional technique, and can be obtained by giving irregularity to the resin layer with which the minute bead of the quality of organic for concavo-convex formation or minerals is not blended.
[0018] Although such concavo-convex grant can be performed to the formed resin layer or the resin layer under membrane formation by the embossing version and the so-called embossing method which pushes a roll-like embossing roll with heating preferably if needed Ultraviolet rays are irradiated, after using more preferably the concavo-convex mold in which the inversion configuration of desired irregularity was formed to the mold face, applying the resin constituent which was excellent in the hardenability of ultraviolet-rays hardenability resin etc. and covering with transparence plastic film. While stiffening the ultraviolet-rays hardenability resin in a concavo-convex mold etc., it is made to unite with transparence plastic film, and it is efficient to carry out by exfoliating after that.
[0019] Since according to the latter approach the repeatability of a mold is excellent especially rather than it is based on the method of embossing former, when it is easy to obtain the meant optical property, the fault to which the irregularity of the product obtained by the so-called embossing method returns with time does not arise, and detailed and the advantage which can obtain a concave convex layer with a degree of hardness arise.
[0020] Drawing 4 is drawing showing the manufacture approach performed using the embossing equipment 10 in the case of using the above ultraviolet-rays hardenability resin etc. First, from a left, it is begun to roll transparence plastic film 2, and supplies toward an embossing roll 12. The front face of this embossing roll 12 is a concave convex surface in which concavo-convex 12a of the inversion configuration of a desired configuration was formed.
[0021] The coating head 13 is installed in the lower part of an embossing roll 12, and the ultraviolet-rays hardenability resin constituent 14 is supplied to it from eye a liquid pool are not illustrated with a pipe 16. It extrudes from the slit 15 which carried out opening of the supplied ultraviolet-rays hardenability resin constituent 14 toward the upper part of the coating head 13, and after making it adhere to the mold face which has concavo-convex 12a of an embossing roll 12, it is made to move to a left by rotation (drawing rotation of the direction of clockwise) of an embossing roll 12, and the layer 17 of transparence plastic film 2 and an ultraviolet-rays hardenability resin constituent is laminated between an embossing roll 12 and nip roll 11a by the side of film supply.
[0022] In addition, changing to laminating transparence plastic film 2, and twisting transparence plastic film 2 around an embossing roll 12 in this way, after making the ultraviolet-rays hardenability resin constituent 14 adhere to a mold face, the ultraviolet-rays hardenability resin constituent 14 may be supplied among them, and transparence plastic film 2 and the layer 17 of an ultraviolet-rays hardenability resin constituent may be laminated.
[0023] While moving the layer 17 of the laminated transparence plastic film 2 and an ultraviolet-rays hardenability resin constituent to the upper part of an embossing roll 12, and the black light 18 installed above the embossing roll 12 performing UV irradiation and stiffening the layer 17 of an ultraviolet-rays hardenability resin constituent, transparence plastic film 2 is made to paste.
[0024] Ultraviolet-rays hardenability resin hardens the layered product of transparence plastic film 2 and the layer 17 of the hardened ultraviolet-rays hardenability resin constituent to transparence plastic film 2 by exfoliating with an embossing roll 12 by exfoliation roll 11b by making it move to the right-hand side of an embossing roll 12, and the optical diffusion film with which the laminating of the concave convex layer which is making the inversion configuration of the concave convex surface of the embossing version was carried out is obtained.

[0025] In the above, what is equipped with transparency and smooth nature and does not have mixing of a foreign matter as a material of transparence plastic film 2 is desirable, and what has a mechanical strength by the reasons of processing and use of a product is desirable.
[0026] Generally a thing desirable as transparence plastic film 2 is the film of thermoplastics, such as cellulose diacetate, cellulose triacetate, cellulose acetate butylate, polyester, a polyamide, polyimide, polyether sulfone, polysulfone, polypropylene, the poly methyl pentene, a polyvinyl chloride, a polyvinyl acetal, a polyether ketone, a polymethyl methacrylate, a polycarbonate, or polyurethane.
[0027] The film of the polyester resin well used for the photographic film which has an emulsion layer is desirable as transparence plastic film 2 in respect of mechanical strength or coating fitness. Transparency is high, there is no anisotropy optically and cellulose triacetate etc. is desirable at the point which is a low refractive index. A polycarbonate is desirable at the point equipped with transparency and thermal resistance.
[0028] In addition, although the film of these thermoplastics is flexible and it is easy to use, when there is no need of bending also including the time of handling and a hard thing is desired, tabular things, such as a plate of the above-mentioned resin and a glass plate, can also be used. As thickness, about 8-1000 micrometers is desirable, and about 50-200 micrometers is more desirable. In addition, this range may be exceeded when it is tabular.
[0029] For improvement in an adhesive property with the layer formed in either the top face or an inferior surface of tongue and both, the coating called others, an anchoring agent, or a primer may be applied beforehand, and a primer layer (not shown) may usually be formed in the above-mentioned transparence plastic film 2. [processing / of various kinds of processings which may be performed, i.e., corona discharge treatment, oxidation treatment, etc. / physical]
[0030] Although the ultraviolet-rays hardenability resin constituent was used in the explanation using drawing 4 when forming the concave convex layer 3, an ionizing-radiation hardenability resin constituent also including an electron ray hardenability resin constituent can be used. As an ionizing-radiation hardenability resin constituent, what mixed suitably a polymerization nature unsaturated bond or the prepolymer which has an epoxy group, oligomer, and/or a monomer is used into a molecule. As ionizing radiation irradiated for hardening, what has a polymerization or the energy quantum which can construct a bridge for a molecule among an electromagnetic wave or a charged-particle line can be used, and ultraviolet rays or an electron ray is usually used.
[0031] As the prepolymer in an ionizing-radiation hardenability resin constituent, and an example of oligomer, acrylate, such as methacrylate, such as unsaturated polyester, such as a condensate of partial saturation dicarboxylic acid and polyhydric alcohol, polyester methacrylate, polyether methacrylate, polyol methacrylate, and melamine methacrylate, polyester acrylate, epoxy acrylate, urethane acrylate, polyether acrylate, polyol acrylate, and melamine acrylate, or a cationic polymerization mold epoxy compound is mentioned.
[0032] As an example of the monomer in an ionizing-radiation hardenability resin constituent Styrene system monomers, such as styrene and alpha methyl styrene, a methyl acrylate, 2-ethylhexyl acrylate, acrylic-acid methoxy ethyl, acrylic-acid butoxy ethyl, Acrylic ester, such as butyl acrylate, acrylic-acid methoxy butyl, and acrylic-acid phenyl A methyl methacrylate, ethyl methacrylate, methacrylic-acid propyl, Methacrylic-acid methoxy ethyl, methacrylic-acid ethoxymethyl, methacrylic-acid phenyl, Methacrylic ester, such as methacrylic-acid lauryl, acrylic-acid-2-(N and N-diethylamino) ethyl, Acrylic-acid-2-(N and N-dimethylamino) ethyl, acrylic-acid-2-(N and N-dibenzylamino) methyl, The permutation amino alcohol ester of partial saturation permutations, such as acrylic-acid-2-(N and N-diethylamino) propyl Unsaturated-carboxylic-acid amides, such as acrylamide and methacrylamide, ethylene glycol diacrylate, Propylene glycol diacrylate, neopentyl glycol diacrylate, Compounds, such as 1,6-hexanediol diacrylate and triethylene glycol diacrylate, Dipropylene glycol diacrylate, ethylene glycol diacrylate, Polyfunctional compounds, such as propylene glycol dimethacrylate and diethylene-glycol dimethacrylate, And/or, the polythiol compound which has two or more thiol groups, for example, TORIMECHIRORA pro pantry thioglycolate, a TORIMECHIRORAPURO pantry CHIOPUROPI rate, pentaerythritol tetra-thioglycolate, etc. are mentioned into a molecule.

[0033] Usually, although one sort or two sorts or more are mixed and the above compound is used as a monomer in an ionizing-radiation hardenability resin constituent if needed, in order to give the usual spreading fitness to an ionizing-radiation hardenability constituent, it is desirable to make said monomer and/or a polythiol compound into 95 or less % of the weight for an aforementioned prepolymer or oligomer 5% of the weight or more.
[0034] When the flexibility when stiffening an ionizing-radiation hardenability resin constituent is required, it is good to reduce the amount of monomers or for the number of functional groups to use the acrylate monomer of 1 or 2. When the abrasion resistance when stiffening an ionizing-radiation hardenability resin constituent, thermal resistance, and solvent resistance are required, the design of an ionizing-radiation hardenability resin constituent is possible for the number of functional groups using three or more acrylate monomers etc. Here, 2-hydroxy acrylate, 2-hexyl acrylate, and phenoxy ethyl acrylate are mentioned for a functional group as a thing of 1. Ethylene glycol diacrylate and 1,6-hexanediol diacrylate are mentioned for a functional group as a thing of 2. A functional group is mentioned for TORIMECHIRORA pro pantry acrylate, a pentaerythritol thoria chestnut rate, pentaerythritol tetraacrylate, a dipentaerythritol hexa AKURE lied, etc. as three or more things.
[0035] Since physical properties, such as flexibility when stiffening an ionizing-radiation hardenability resin constituent and surface hardness, are adjusted, by ionizing-radiation exposure, the resin which is not hardened can also be added to an ionizing-radiation hardenability resin constituent. There are the following as an example of concrete resin. It is thermoplastics, such as polyurethane resin, cellulosic resin, polyvinyl butyral resin, polyester resin, acrylic resin, polyvinyl chloride resin, and polyvinyl acetate. Especially, addition of polyurethane resin, cellulosic resin, polyvinyl butyral resin, etc. is desirable in respect of improvement in flexibility.
[0036] When hardening of an ionizing-radiation hardenability resin constituent is performed by an optical exposure, especially UV irradiation, a photopolymerization initiator and a photopolymerization accelerator are added. independent [in acetophenones, benzophenones, MIHIRA benzoyl benzoate, alpha-AMIROKI SIMM ester, thioxan tons, a benzoin, benzoin methyl ether, etc.] as a photopolymerization initiator in the case of the resin system which has a radical polymerization nature partial saturation radical -- or it mixes and uses. Moreover, in the case of the resin system which has a cationic polymerization nature functional group, aromatic series diazonium salt, aromatic series sulfonium salt, aromatic series iodonium salt, a meta-cellon compound, a benzoin sulfonate, etc. are used as independent or mixture as a photopolymerization initiator. The addition of a photopolymerization initiator is 0.1 - 10 weight section to the ionizing-radiation hardenability resin constituent 100 weight section. In addition, n butylamine, triethylamine, or tri-n-butyl phosphine can be used as a sensitizer.
[0037] In an ionizing-radiation hardenability resin constituent, the following organic reaction nature silicon compounds may be used together. 1 of an organic silicon compound can be expressed with general formula RmSi(OR') n, R and R' expresses the alkyl group of carbon numbers 1-10, and suffix m of R and suffix n of R' are integers with which each fills the relation of m+n=4.
[0038] Specifically A tetramethoxy silane, a tetra-ethoxy silane, tetra--iso-propoxysilane, Tetra--n-propoxysilane, tetra--n-butoxysilane, tetra--sec-butoxysilane, Tetra--tert-butoxysilane, a tetra-pentaethoxy silane, Tetra-PENTA-iso-propoxysilane, tetra-PENTA-n-propoxysilane, Tetra-PENTA-n-butoxysilane, tetra-PENTA-sec-butoxysilane, Tetra-PENTA-tert-butoxysilane, methyl triethoxysilane, A methyl tripropoxy silane, MECHIRUTORI butoxysilane, dimethyldimethoxysilane, Dimethyl diethoxysilane, a dimethylethoxy silane, dimethyl methoxysilane, dimethyl propoxysilane, dimethyl butoxysilane, methyl dimethoxysilane, methyldiethoxysilane, hexyl trimethoxysilane, etc. are mentioned.
[0039] 2 of the organic silicon compound which can be used together to an ionizing-radiation hardenability resin constituent is a silane coupling agent. Specifically gamma-(2-aminoethyl) aminopropyl trimethoxysilane, gamma-(2-aminoethyl) aminopropyl methyl dimethoxysilane, beta-(3, 4-epoxycyclohexyl) ethyltrimethoxysilane, gamma-aminopropyl triethoxysilane, gamma-methacryloxypropyl methoxysilane, N-beta-(N-vinylbenzyl aminoethyl)-gamma-aminopropyl

methoxysilane and a hydrochloride, Gamma-glycidoxypropyltrimetoxysilane, an amino silane, methyl methoxysilane, Vinyltriacetoxysilane, gamma-mercapto propyltrimethoxysilane, Gamma-chloropropyltrimetoxysilane, hexamethyldisilazane, A vinyl tris (beta-methoxyethoxy) silane, octadecyl dimethyl [3-(trimethoxysilyl) propyl] ammoniumchloride, methyltrichlorosilane, dimethyldichlorosilane, etc. are mentioned.

[0040] 3 of the organic silicon compound which can be used together to an ionizing-radiation hardenability resin constituent is an ionizing-radiation hardenability silicon compound. A with a molecular weight of 5,000 or less which specifically has two or more functional groups which react and construct a bridge by the exposure of ionizing radiation, for example, a polymerization nature double bond radical, organic silicon compound is mentioned, and, more specifically, piece end vinyl functionality polysilane, both-ends vinyl functionality polysilane, a piece end vinyl organic-functions polysiloxane, a both-ends vinyl organic-functions polysiloxane, the vinyl functionality polysilane to which these compounds were made to react, or a vinyl functionality polysiloxane is mentioned.

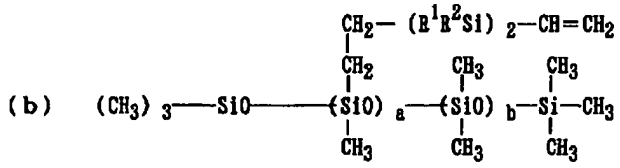
[0041] More specifically, they are the following compounds.

[0042]

[Formula 1]

(a) $CH_2=CH-(R^1R^2Si)_n-CH=CH_2$

(b)



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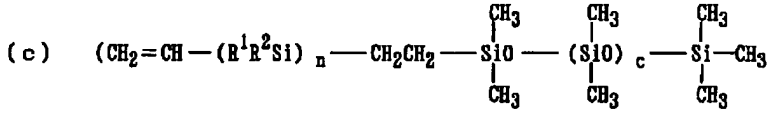

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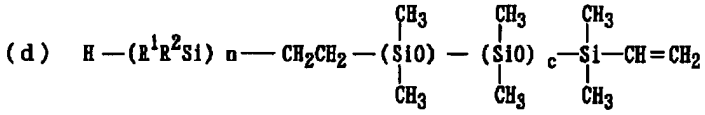

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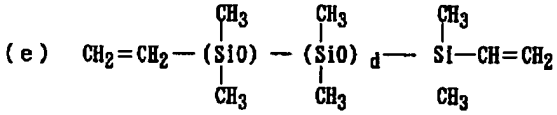

上記（ａ）～（ｅ）の式中、R^1およびR^2は炭素数１～４のアルキル基であり、
ａ～ｄおよびｎは、分子量が５，０００以下になる値である。

[0043] In addition, as an organic silicon compound which can be used together to an ionizing-radiation hardenability resin constituent, acryloxy (meta) silane compounds, such as 3-(meta) acryloxyprophyltrimethoxysilane and 3-(meta)acryloxypropylmethyldimethoxysilane, etc. are mentioned.

[0044] Although the roll-like embossing roll 12 was used in the example which quoted drawing 4 when manufacturing the optical diffusion film 1 of this invention, a plate-like embossing plate can also be used. Although the concave convex surface of molds, such as an embossing roll 12 or a plate-like embossing plate, can be formed by various approaches, it is desirable to form by the sandblasting method at the point which is the processing approach which has the repeatability of a concavo-convex configuration (Rz and peak count), and is flexible.

[0045] As mold material for forming a concave convex surface, what consists of a metal, plastics, trees, or these complex is used. At the point which cannot be easily worn out at the time of reinforcement or repeat use, as a metal, chromium is desirable, it is viewpoints, such as economical efficiency, and what plated chromium on the front face of an iron roll is suitable.
[0046] As a particle size (diameter) of these particles, an about [#60-#350] thing is used as an example, using minerals particles, such as metal particles or a silica, an alumina, or glass, as a particle to spray. It is good also as a liquid sandblasting method which used together the proper liquid, for example, water, on this occasion although these particles were sprayed with the high-speed gas when spraying these particles on mold material, and repeatability is excellent and a work environment top also has the advantage of being desirable rather than it is based on the dry method which does not use a liquid together, when based on the liquid sandblasting method.
[0047] It is desirable to use it for it, since chrome plating etc. is given and dura-mater-ized in the concave convex surface in which irregularity was formed and corrosion resistance is raised to it in order to raise the endurance at the time of use. In addition, by plating, when it has influences of some on the irregularity produced by the sandblasting method, the sandblasting method is given in consideration of plating.
[0048] The optical diffusion film 1 of this invention is replaced with the protection film 107 in the conventional technique which quoted and explained drawing 1 , and is placed on the lens sheet 106 of surface light source equipment 102, and a liquid crystal display 100 is arranged and used for it on the surface light source equipment 102 combined with the optical diffusion film 1 in this way. As the optical diffusion film 1 shows drawing 2 (a), the concave convex layer 3 uses in piles that by which the laminating of the concave convex layer 3 is carried out only to one side of transparence plastic film 2 so that the lens sheet 106 side may be suitable.
[0049]
[Example] (Example 1) After thickness sprayed the front face of this chrome plating roller with water in the iron grain child of 250 meshes by preparing the chrome plating roller which gave chrome plating which is 20 micrometers and formed irregularity in the front face of an iron roller on the front face, chromium was plated in the concave convex and the embossing roller which has the irregularity of the shape of detailed crepe on a front face was obtained.
[0050] After having applied ultraviolet-rays hardenability resin (the Dainippon Ink & Chemicals, Inc. make, RC 19-941) to the embossing roll, and laminating the polyethylene terephthalate resin film as transparence plastic film in the spreading side using the equipment explained using drawing 4 , then irradiating ultraviolet rays from a film side using the ultraviolet-rays light source (fusion company make, D bulb), it exfoliated and the optical diffusion film which has the concave convex layer of this invention was obtained.
[0051] It was 1.15 micrometers when the ten-point average of roughness height of the concave convex layer of the obtained optical diffusion film was measured. Moreover, the peak number of counts when setting peak count level to **0.1 micrometers of the center line of a granularity curve, and setting measurement length to 0.8mm was 23.
[0052] The optical diffusion film obtained above is used among drawing 1 as an optical diffusion film which attached the sign 107. As a lens sheet 106 A cross section all turns a lens side for two things (the Sumitomo 3M make, BEF) which arranged the slot on the rectangular equilateral triangle in the equal pitch up. And as the direction of a slot intersected perpendicularly, it was used in piles, and as an optical diffusion film 105 of the inferior surface of tongue of the lens sheet 106, surface light source equipment was assembled using lot number;D121 Made from TSUJIDEN. Moreover, others assembled surface light source equipment similarly using the conventional thing (Product made from TSUJIDEN, and lot number;D117U) which has the resin layer which contains a bead for the optical diffusion film which attached the sign 107 as an example of a comparison.
[0053] When the transverse-plane brightness of the surface light source equipment of an example and the example of a comparison was measured with the angle of visibility of 2 degrees using the color luminance meter (TOPCON Make, lot number;BM-7), in the thing of an example, they were 1361

cd/m2 at the thing of 1386 cd/m2 and the example of a comparison. Moreover, although there was no generating of the blemish on a lens sheet at the thing of an example when the generating condition of the blemish on a lens sheet after carrying 50g weight on the optical diffusion film (107) of the surface light source equipment of an example and the example of a comparison and dragging in the direction of a field by 100mm/second in rate was observed In the thing of the example of a comparison, the blemish occurred along the direction which dragged the optical diffusion film, and omission of a bead were also seen.

[0054]

[Effect of the Invention] Since according to invention of claim 1 the optical diffusion film was replaced with the irregularity by the conventional bead content resin layer, the concave convex layer was constituted from a transparence resin layer which does not contain a bead and the ten-point average of roughness height and the peak number of counts of the irregularity were specified Since a bead is contained conventionally, having harmed front faces, such as a lens sheet, is canceled. And the transmission of the part which does not contain the bead, and light increases, and the retroreflection which will not be avoided if the bead is contained is prevented, and the optical diffusion film whose transverse-plane brightness improved can be offered. According to invention of claim 2, in addition to the effect of the invention of claim 1, concavo-convex formation is possible at the time of a concave convex layer laminating, and the optical diffusion film which is easy to manufacture can be offered at it. According to invention of claim 3, in addition to the effect of the invention of claim 1, front faces, such as other sheets which contact, are not harmed in which field, concavo-convex formation is possible at the time of a concave convex layer laminating, and the optical diffusion film which is easy to manufacture can be offered at it. According to invention of claim 4, after forming a concave convex surface by sandblasting processing, carrying out a laminating to the obtained concave convex surface with the application of an ionizing-radiation hardenability resin constituent and transparence plastic film, such as ultraviolet-rays hardenability resin, and an ionizing-radiation exposure performing hardening and adhesion, by exfoliating from concavo-convex one side, manufacture effectiveness is good and the manufacture approach of an optical diffusion film with a quick manufacture rate can be offered. Since a laminating is moreover performed [according to invention of claim 5] in addition to the effect of the invention of claim 4, twisting transparence plastic film, using a roll-like thing as mold material, the manufacture approach of the optical diffusion film suitable for the mass production using long transparence plastic film can be offered. According to invention of claim 6, the optical diffusion film obtained by having the effectiveness on the manufacture approach of claim 4 or claim 5 can be offered. According to invention of claim 7, since either of claims 1-3 or the optical diffusion film of claim 6 is applied to surface light source equipment, the optical diffusion film in which transverse-plane brightness is high and the prevention to which a lens sheet gets damaged is possible can be offered. According to invention of claim 8, since the surface light source equipment of claim 7 is arranged, it can be bright, the high image of contrast can be checked by looking, and the display in which the prevention to which a lens sheet gets damaged is possible can be offered.

[Translation done.]